

# THE DERMANYSSID MITES OF NORTH AMERICA.

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## INTRODUCTION.

The Dermanyssid mites are here regarded as constituting a family, the Dermanyssidae, of the superfamily Gamasoidea.<sup>1</sup> They were so recognized, in a broader sense by Banks (1904), but later (1915) Banks reduced the group to the rank of a subfamily. His former decision in the matter will appear, the writer believes, amply justified when the unity of the group and its possibilities of division into various genera are considered.

The family Dermanyssidae is characterized as follows: Mouth parts adapted for piercing, the chelicerae being either devoid of one or both of the chelae or of all true teeth; but, however, recurved "holdfast" hooklike structures are sometimes present. Integument somewhat leathery and distensible, but covered to a large degree by one or more dorsal shields and one or more ventral plates. Each tracheal trunk opening through a peritreme situated on the side of the body. Sexual dimorphism evident and at times marked. Parasitic in habits and on vertebrates.

Using the mouth parts as a basis, we can easily divide the family into four major groups, which are here given the rank of subfamilies. These subfamilies and their contained genera are separated as follows:

### KEY TO THE SUBFAMILIES AND GENERA OF DERMANYSSIDAE.

- a*<sup>1</sup>. Chelicerae adapted for both piercing and attachment, being provided with recurved barbs or hooks.
- b*<sup>1</sup>. Both chelae of chelicera present, the fixed one harpoonlike with a single recurved barb and the movable one falciform; hypostome without recurved hooks..... Subfamily **ENTONYSSINAE**, new subfamily.  
Containing but one genus..... **Entonyssus**, new genus.
- b*<sup>2</sup>. One chela of chelicera lost, the remaining one provided with several recurved hooks; hypostome with a pair of recurved hooks.  
Subfamily **IXODORYNCHINAE**, new subfamily.  
Containing but a single genus..... **Ixodorhynchus**, new genus.

<sup>1</sup> According to the rules of nomenclature it may be necessary to change the name of the type genus of this group to *Parasitus*. To do so, however, is most unfortunate not only because the name Gamasidae has been established by a century of usage but also because the name *Parasitus* is applied to free-living mites, hence is directly misleading in its meaning.

a<sup>2</sup>. Chelicerae provided only for piercing, hence without hooks or barbs.

b<sup>1</sup>. Chelicerae shearlike in both sexes, never needlelike.

Subfamily **LIPONYSSINAE**.

c<sup>1</sup>. Body of both sexes entirely covered above by dorsal shield, sternal plate of female large and reaching to the third coxae. . . . . **Tetragonyssus**, new genus.

c<sup>2</sup>. Body not entirely covered above by dorsal shield in either sex.

d<sup>1</sup>. Female with a divided dorsal shield.

e<sup>1</sup>. Posterior dorsal shield large, covering much of abdomen above; first segment of palpus of female with a hornlike process.

**Ceratonyssus**, new genus.

e<sup>2</sup>. Posterior shield minute; sternal plate with only four setae; first segment of palpus of female without any hornlike process.

**Serpenticola**, new genus.

d<sup>2</sup>. Dorsal shield of female entire.

e<sup>1</sup>. Legs stout; tibia I and II less than one and a half times as long as broad; femora I and II spined above. . . . . **Ichoronyssus** Kolenati.

e<sup>2</sup>. Legs not so stout, especially the first and second pairs, tibiae I more than one and a half times as long as broad; femora I and II not spined above.

f<sup>1</sup>. Body of female with a constriction and incomplete transverse groove behind the insertion of the last pair of legs.

**Leiognathus** Canestrini.

f<sup>2</sup>. Body of female without constriction and incomplete transverse groove.

**Liponyssus** Kolenati.

b<sup>2</sup>. In the female, chelicerae needlelike; in the male, variously modified but always with both arms present. . . . . Subfamily **DERMANYSSINAE**.

c<sup>1</sup>. Dorsal shield of female entire; anus situated in posterior part of anal plate.

**Dermanyssus** Dugès.

c<sup>2</sup>. Dorsal shield of female divided; anus situated centrally in anal plate.

**Allodermanyssus**, new genus.

One of the new subfamilies here created, the *Ixodorhynchinae*, is established for the new genus *Ixodorhynchus*, which contains a single species, also new. This species was taken some years ago in Iowa from the eyes of a snake and is quite remarkable. Its general characters are almost entirely those of the genus *Liponyssus*, *sensu lato*, yet the mouth parts are very much like those of some of the generalized ticks. The hypostome (fig. 3), while divided, is shaped for piercing and is provided with two powerful "holdfast" organs in the form of recurved hooks. The chelicerae are even more ticklike, being but little different from those of some of the true Ixodidae. They are short, stout, segmented at the middle, without one chela; and with the other, which is movable, provided with three powerful recurved hooks. In addition, two small tubercles are present at the base of the chela on the chelicera proper.

Some may doubt the justification of placing this species in the Dermanyssidae. True it is that the mouth parts are entirely different from those of the family Dermanyssidae as we have defined the family in the past. But if the species is not placed in this group the only other alternative is to create for it a new family. This latter course hardly appears justified at present in view of the fact that

the number of families in the Acarina has been increased at an entirely too great a rate in recent years.

The other new subfamily created, the *Entonyssinae*, is established for the genus *Entonyssus*, with its single species, also new. This species was taken by Doctor M. C. Hall from the air sac of a snake. In *Entonyssus* each chelicera has one arm provided with a single hook (fig.1), but the hypostoma is without hooks.

#### GENERIC CHARACTERS IN DERMANYSIDAE.

Recent workers have recognized but few genera in this family. The reasons for this are in part obvious. First, the genera proposed by the earlier workers, and more especially those proposed by Kolenati in 1859, were either based upon immature individuals or upon characters which could not be accepted as valid in the light of what is known about generic characters in related mite families. Second, but few of our recent mite specialists have had any considerable number of species to work with.

On account of this latter fact the present writer has been deterred for years in attempting any generic analysis of the group. Now, however, a sufficient amount of material is at hand to justify such an attempt. For the purposes of this analysis the genus concept will be defined as follows: A valid genus is a taxonomic category including either a unique species with one or more characters of a more fundamental nature than those used in specific diagnoses of the most nearly related species, or a category including a group of closely related species the majority of which possess at least two correlated characters of more than commonly recognized specific importance in the next larger group to which the genus belongs. The family Dermanyssidae does not lend itself so easily to generic analysis as the Gamasoidea as a whole does.

#### KOLENATI'S GENERA.

Kolenati (1859) was the first to make any extensive study of the group. In his *Beiträge zur Kenntniss der Arachniden* he not only proposes several new genera for the reception of his various species but divides the group into the following subgroups, for which English equivalent names are substituted: Fat mites, dirty mites, big mites, rough mites, broken-shield mites, and jointed-shield mites. Although written in a more or less popular manner, Kolenati's work is of high scientific value, and the species he describes are so well illustrated that no serious difficulty should be encountered in grasping their taxonomic value. The chief difficulty in passing on Kolenati's work is that he did not differentiate between the sexes or between nymphs and adults in his descriptions. Also in many instances one can not tell whether a drawing was made of a male or female or a

nymph. This is not always true, however, for in some of his drawings it is easy to recognize whether a male, female, or nymph is represented. Kolenati's genera are here taken up according to their page preference.

*Liponyssus*.—This monobasic genus is the one most commonly used at present to include all the members of the family Dermanyssidae that have the chelicerae shearlike in both sexes. It has page preference over Kolenati's other genera, and for this reason some workers consider all the other genera of Kolenati as synonyms of this one. Kolenati gave three drawings of the type species of this genus, one being a dorsal view of an adult. The ventral view which he gives is either of a nymph or a female, probably the latter. The characters of the single, large, dorsal shield of the adult figured, together with what other characters that can be gleaned from Kolenati's description, are sufficient to show that this species belongs in the group having the broad shield with a broad, evenly rounded posterior border, and is nearly related to *Liponyssus corethroproctus* Oudemans.

*Ichoronyssus*, Kolenati's second genus, which included a number of species, was for a long time ignored. Recently (1915) Hirst gives this genus as being equal to *Leiognathus* Canestrini, a generic name which he had accepted previously as being practically equal to the *Liponyssus* Kolenati as interpreted by Banks and Oudemans. He adds, however, that *Ichoronyssus* Kolenati as he would use the genus is "probably not that of Kolenati." The species which Hirst places in *Ichoronyssus* Kolenati has two dorsal shields in the case of the female. All of the species figured by Kolenati under the generic name of *Ichoronyssus* have the dorsal shield entire. In fact, he specifically relegates those species with a divided dorsal shield to two of his other genera. The present writer believes that the genus *Ichoronyssus* Kolenati can be retained only by selecting with some care the proper genotype. One of the species included by Kolenati, *scutatus*, is sufficiently different and characteristic from the others to be used for a genus which should not be reduced to synonymy. Around this species as a type several of our more recently described species group themselves, and, luckily, all show a correlation of characters sufficiently important to be used as generic.

*Macronyssus* included two species, *longimanus* and *lepidopeltis*. Oudemans (1903) gives complete descriptions of nymph, male, and female of *lepidopeltis* together with many drawings. This species is not so very different from *Liponyssus lacertinus* (Berlese) and evidently belongs to the *setosus* group, for which *L. setosus* Kolenati stands as a monobasic type. The other species, *longimanus*, for which Kolenati gives a good drawing of a ventral view of a female and dorsal view of an adult, evidently belongs to the *setosus* group. Therefore, it appears that *Macronyssus* should fall into synonymy under *Liponyssus*, the latter genus having page preference.

*Lepronyssus* included several species, but the present writer can not at this time find any one of these that could stand as a type for a good genus. Since Kolenati's material was so widely distributed it would appear that in the future a study of this material would enable some one to preserve the genus. Any hasty selection of a type species in this genus would almost surely bury it permanently in synonymy.

*Steatonyssus* is evidently based largely on immature individuals, as both Kolenati's generic diagnosis and figures indicate. Of his four drawings two certainly are of nymphs and the remaining two probably of nymphs.

*Pimelonyssus*, the last of Kolenati's genera, is likewise based on characters of immature individuals.

#### DESCRIPTIONS OF GENERA HERE RECOGNIZED.

##### ENTONYSSUS, new genus.

Chelicerae with fixed arm harpoonlike, being sharply pointed and with a single, recurved distal hook, and with the moveable arm falci-form; hypostome without recurved hooks. Palpi moderate, filiform. Legs all similar and each tarsus provided with a pulvillus and two equal claws. The tarsal claws are very stout and strongly curved near their bases, but slender, straight, and sharply pointed distally.

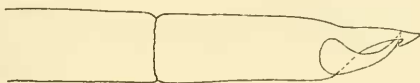


FIG. 1.—ENTONYSSUS HALLI, NEW SPECIES. VENTRO-INTERNAL VIEW OF CHELICERA.

*Type species.*—*Entonyssus halli*, new species.

The mouth parts in *Entonyssus* are so different from those of the other Dermanyssidae that a new subfamily should be created for it. This has been done, the subfamily Entonyssinae having been given in the key to genera.

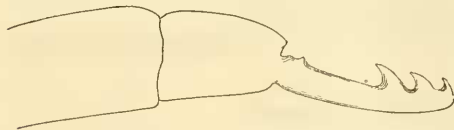


FIG. 2.—IXODORHYNCHUS LIPONYSSOIDES, NEW SPECIES. SIDE VIEW OF CHELICERA.

##### IXODORHYNCHUS, new genus.

Chelicerae each with but a single arm, which is provided with recurved hooks; hypostome large, divided and provided with a pair of recurved processes or hooks. Dorsal shield divided, the two parts completely covering the body above. Legs short, stout, spined.

*Type species.*—*Ixodorhynchus liponyssoides*, new species.

The relationships of this genus have already been discussed.

## CERATONYSSUS, new genus.

Chelicera shearlike, being provided with both arms; hypostome without recurved hooks; basal segment of palpus of female with a hornlike process; dorsal shield of female divided, the posterior shield being large and about as long as the anterior.

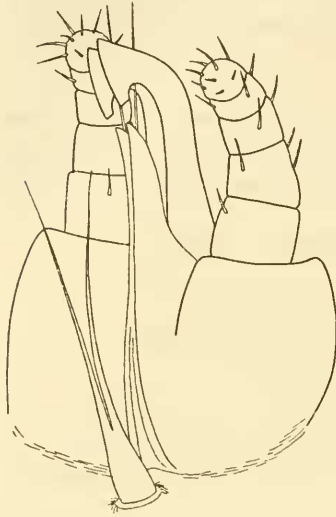


FIG. 3.—*IKODORHYNCHUS LIPONYSSOIDES*, NEW SPECIES. VENTROLATERAL VIEW OF MAXILLAE.

*Type species*.—*Ceratomyssus musculi* (C. L. Koch).

The employment of sexual characters for distinguishing genera has its objections, and under most conditions such characters should not be used. In the Gamasoidea, however, where the sexes are so different and where other characters than those of one sex only are hard to find, or for purposes of generic distinction do not exist, there is ample justification for the practice.

Besides the type, this genus includes *Liponyssus javensis* Oudemans and *Ceratomyssus ceratognathus*, new species, to be described in this paper.

## SERPENTICOLA, new genus.

Chelicerae as in *Liponyssus*. Dorsal shield of female divided, the posterior shield being minute and subcircular; sternal plate of female with only four setae; basal segment of palpus in female without hornlike process; anal plate of female as in bird infesting *Liponyssus* species.

*Type species*.—*Liponyssus serpentium* (Hirst).

Only a single species included in this genus. It parasitizes American snakes.

## TETRAGONYSSUS, new genus.

Chelicerae as in *Liponyssus*. Body large and in the type species squarish behind and with pronounced shoulders in front. Dorsal shield entire and completely covering the body in both sexes; legs stout, spined above; sternal plate of female large, reaching third coxae; ventral plate of male quadrangular in front.

*Type species*.—*Liponyssus gigas* Oudemans.

Besides the type two other species should probably be included in this genus, *L. spiniger* Ewing and Stover and *L. bermudaensis* Ewing.

Genus *INCHORONYSSUS* Kolenati.

Chelicerae as in *Liponyssus*. Body stout with shoulder regions well marked, abdomen not squarish behind; dorsal shield entire; legs stout, tibiae I and II never as much as one and a half times as long as broad, femur I and II spined above.

*Type species*.—Here designated as *Ichoronyssus scutatus* Kolenati.

Other species going in this genus are: *Liponyssus semitectus* (L. Koch); *L. spinosus* Oudemans; *L. arcuatus* (C. L. Koch); *L. carnifex* (C. L. Koch);

*L. isabellinus* Oudemans; *L. albatu*s (C. L. Koch) (Berlese). It also includes *L. sternalis*, new species, described in this paper.

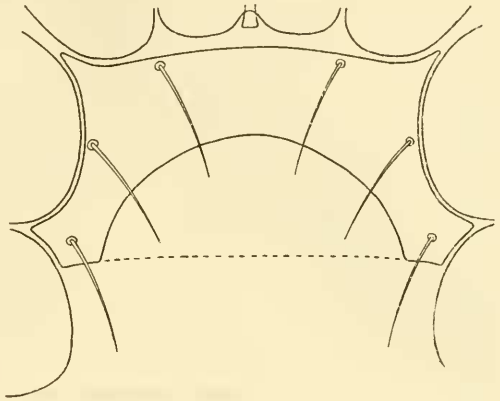


FIG. 4.—*ICHORONYSSUS CARNIFEX* (C. L. KOCH.) STERNAL PLATE OF FEMALE.

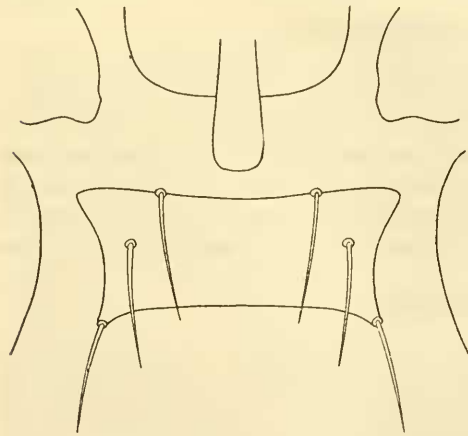
Genus *LEIOGNATHUS* Canestrini (s. st.).

Chelicerae as in *Liponyssus*. Body not entirely covered above by dorsal shield or shields in either sex; legs not very stout, tibia I always more than one and a half times as long as broad, femora I and II not usually spined above; in the case of the female the body is constricted suddenly and is provided with an incomplete transverse groove behind the insertion of the last pair of legs.

*Type species*.—*Leiognathus sylviarum* (Canestrini and Fanzago).

Besides the type, this genus, in its restricted sense, should include *Liponyssus*

FIG. 5.—STERNAL PLATE AND STERNAL REGION OF A *LIPONYSSUS* SPECIES (L. BACOTI IHIRST).



*nyssus crosbyi* Ewing and *L. constrictus*, new species, which is described in this paper.

Genus *LIPONYSSUS* Kolenati.

Chelicerae with both arms present and shearlike. Body not entirely covered in either sex by dorsal shield; legs not very stout,

tibia I more than one and one-half times as long as broad, femora I and II usually not spined above; body of female without constriction and incomplete groove behind insertion of last pair of legs.

*Type species.*—*Liponyssus setosus* Kolenati.

The genus *Ophionyssus* Mégnin (1884) should be considered as a synonym of *Liponyssus* as was pointed out by Berlese (1917).

The genus *Liponyssus* as here defined still includes most of its old species, among them being the following: *Lepronyssus fossulatus* Kolenati; *Liponyssus corethroproctus* Oudemans; *Macronyssus longimanus* Kolenati; *Liponyssus uncinatus* (Canestrini); *L. americanus* Banks; *L. canadensis* Banks; *L. bursa* (Berlese); *L. bacoti* (Hirst); *Ichoronyssus decussatus* Kolenati; *L. lepidopeltis* (Kolenati); *L. lacertinus* (Berlese); and *L. natricia* (Gervais). Also the following new species here to be described go in this genus: *L. tenuiscutatus*, *L. pacificus*, and *L. montanus*.

#### Genus *DERMANYSSUS* Dugés.

In the female the chelicerae are long and needlelike, being composed of two closely adhering elements, which probably represent the two arms of *Liponyssus*. In the male the chelicerae are not needlelike, but are variously formed, both arms being always present and easily recognized. Dorsal shield large and undivided in both sexes; legs rather slender, especially the front pair. Rim of anus greatly thickened behind, and the anus itself usually situated in the posterior half of anal plate.

*Type species.*—*Dermanyssus gallinae* (Redi).

In 1913 Hirst proposed *Liponyssoides* as a new subgenus for a rat-infesting species. He stated that the capitulum was differently shaped from that of *Dermanyssus* and that the male chelicera was provided with a flagellum bearing a small tooth. It is to be questioned if the type of chelicera described by Hirst is really different fundamentally from that of the male of *D. gallinae*. Therefore, it appears best to leave *Dermanyssoides* as a subgenus, denying it generic rank.

#### *ALLODERMANYSSUS*, new genus.

Mouth parts similar to those of *Dermanyssus*. Dorsal shield in female divided into two plates, the posterior one being minute; in the male, dorsal shield attenuated posteriorly. Sternal plate squarish and with six setae. Anal plate egg shape in outline and with anus situated centrally. Legs as in *Dermanyssus*.

*Type species.*—*Dermanyssus sanguineus* Hirst.

This genus is amply distinct from *Dermanyssus*, showing in the formation of the dorsal shield, the sternal plate, and anal plate a correlation of three fundamental characters.



## DESCRIPTIONS OF NORTH AMERICAN SPECIES.

**Genus ENTONYSSUS Ewing.****ENTONYSSUS HALLI, new species.**

*Female*.—A medium-sized, light-brownish gamasoid. Palpi moderate, of generalized type, a few minute spinelike setae at tip, the one on the inside being the largest; chelicerae moderate, fixed arm harpoonlike, with a sharp point and a distal, backwardly directed barb, movable arm not extending to the tip of fixed arm and shaped like the claw of a hawk. Dorsal shield large and undivided. Stigmata situated ventrolaterally above and behind the third coxae. Sternal plate large and reaching to the posterior margin of third coxae. Anal plate large and extending to the posterior margin of abdomen. Legs similar in shape, the posterior pair being the longest; tarsus of leg I about twice as long as tibia; claws of all the legs stout and strongly curved at their base but with their distal part tapering to a fine sharp point. Length, 0.69 mm.; width, 0.41 mm.

*Male*.—Unknown.

*Type locality*.—(?)

*Holotype*.—Cat. No. 24743, U.S.N.M.

Described from holotype specimen taken from air sac of Pine snake at National Zoological Park by Dr. M. C. Hall on October 14, 1908. Two or three other specimens were taken, but these were practically destroyed in the process of preparation. One of them is on slide with type.

**Genus IXODORHYNCHUS Ewing.****IXODORHYNCHUS LIPONYSSOIDES, new species.**

A stout brownish species, with the sides of the body about parallel. Palpi moderate, filiform. Chelicerae not large but heavily chitinized, three recurved hooks present, the proximal being the largest and the distal smallest, arm of chelicera longer than the distal segment from which is springs. Dorsal shield entirely covering the body and divided by a transverse suture into two subequal parts. Peritreme long, sinuous, and extending beyond the anterior coxae. Sternal plate large, reaching third coxae. Anal plate oval, with anus situated centrally. Legs short, stout, subequal; tarsus of leg I about one and a half times as long as the tibia, the latter being almost as broad as long; patella of leg I with four long, stout spines above; femur with two similar but even larger spines. Length, 0.63 mm.; width, 0.44 mm.

*Type locality*.—Madrid, Iowa.

*Type slide*.—Cat. No. 24744, U.S.N.M.

Described from various cotypes mounted on five different slides. All specimens collected by M. F. Boyd from eye of snake at Madrid,

Iowa. On two of the five slides in the United States National Museum are the mouth parts dissected so as to show their nature to a better advantage.

Genus **TETRAGONYSSUS** Ewing.

KEY TO NORTH AMERICAN SPECIES.

- a*<sup>1</sup>. Species larger and much more heavily spined; at least one pair of spines on femur I almost half as long as front legs; and plate fully twice as long as broad. anus with an even but enormously thickened rim, anal setae minute.  
**T. spiniger** (Ewing and Stover).
- a*<sup>2</sup>. Species smaller and much less heavily spined; longest spine of femur I less than one-third the length of leg I; anal plate subtriangular and about as broad as long, anus with an uneven and but moderately thickened rim, anal setae large spines which almost reach the tip of anal plate... **T. bermudaensis** (Ewing).

**TETRAGONYSSUS SPINIGER** (Ewing and Stover).

*Female*.—Large and spiny. Palpus and chelicera rather small; one of the arms of the latter longer than the other. Above the body is sparsely clothed with short spines, those toward the front being recurved and along each side there is a row of longer spines. Peritreme very sinuous and extending to opposite the anterior coxae. Sternal plate very large, longer than broad, and reaching the fourth coxae. Anal plate twice as long as broad, and broadly rounded in front; anus oval in outline, rim almost as broad as anal aperture and of even thickness; anus itself situated almost entirely in front of the middle transverse line; paired setae, minute, situated on rim of anus; median seta large and situated on a low tubercle at base of caudal area, the latter being triangular and scobinate. Legs stout, especially the first two pairs; dorsal spines of femur I two in number, the outer situated on a tubercle and enormous, being half again as long as the inner. Length, 0.78 mm.; width, 0.51 mm.

*Male*.—Considerably smaller than the female. Dorsal shield large but short, broadly rounded behind and not extending beyond the middle of abdomen, sides convex. Holoventral plate very much produced between the second and third coxae and expanded on the abdomen, with the following spinelike setae: A pair on either side of genital opening; a pair opposite second coxae and another opposite third coxae; a pair situated on a level between the third and fourth coxae and six pairs on abdominal part of plate. Genital opening somewhat funnel shaped with well-developed rim. Anus almost circular, situated about twice its greatest diameter from the posterior margin of holoventral plate. Length, 0.65 mm.; width, 0.38 mm.

*Type locality*.—Ithaca, New York.

*Type*.—A single female, the uppermost specimen on type slide, is here designated as type.

The description here given is based on specimens on type slide, which were taken from muskrat. Other records are: Many specimens from muskrat, Florence, Montana, March 27, 1910, Dallas acc. 2437; one specimen from muskrat, Cambridge, Maryland, March 16, 1909, by N. Hollister; six specimens from muskrat, Amherst, Massachusetts, February 16, 1908, by C. W. Hooker.

**TETRAGONYSSUS BERMUDAENSIS (Ewing).**

*Female*.—Body and appendages uniform light yellowish brown. Palpi long. Body sparsely clothed above with moderate setae; around the lateral margins is a row of setae which are scarcely as long as some of those on the dorsum. Peritreme S-shaped and extending to about the middle of second coxae. Sternal plate about as broad as long, reaching the third coxae; anterior setae situated on anterior margin; middle setae situated on lateral margins and posterior setae at the posterolateral corners; all sternal setae very long and subequal. Anal plate somewhat triangular in shape; anus squarish in front and rounded behind, and situated almost centrally; paired setae spinelike and situated near the posterior margin of anus; median seta almost enormous and situated at the base of caudal area, the latter being crescentic and scobinate. Femur of leg I with three dorsal setae, the outer being the longest and the posterior the shortest. Length, 0.65 mm.; width, 0.46 mm.

*Male*.—Not known.

*Type locality*.—Bermuda.

*Type*.—A single female, the only one mounted with dorsal side upward on type slide, is here designated as type.

Description based on individuals on type slide, all of which were taken from wood rat, Bermuda, July 9, 1910, by A. O. Gross.

**Genus CERATONYSSUS Ewing.**

**CERATONYSSUS CERATOGNATHUS, new species.**

*Female*.—A medium-sized species. Palpi reaching slightly beyond first femora; chelicerae with two arms equal and hooked at their tips. Dorsal shield divided; posterior shield about as long as anterior, truncate in front, sides convex, and extending almost to the posterior margin of abdomen. Peritreme sinuous, extending to about the middle of second coxa. Sternal plate fully twice as broad as long; anterior setae situated on the anterior margin; middle setae situated just inside of lateral margins and nearer to posterior than anterior setae; posterior setae situated on angular corner extensions; all sternal setae long and subequal. Anal plate heart-shaped, with the anus situated entirely in the anterior half; paired setae situated near rim of anus; median seta subequal to paired setae and situated

about its length behind the anus; caudal area large, not crescent-shaped, and provided with longitudinal roughened ridges. Anterior legs longer than the second legs, which are slightly the stoutest.

Length, 0.65 mm.; width, 0.39 mm.

*Male*.—Smaller than the female. Palpi without the conspicuous inner horn of basal segment found in the female; chelicerae about as in female. Dorsal shield large and entire, covering most of the body and reaching almost to the tip of abdomen, broadest at the shoulders and with lateral margins convex behind the shoulders. Holoventral plate broadest at its angular expansions between the second and third coxae, not laterally expanded on the ventral surface of abdomen; genital duct chitinized for a considerable distance behind the genital opening; genital opening with well-developed rim; genital setae situated about halfway between the genital opening and lateral margins of plate. Anus with longitudinal diameter about twice as great as transverse, and situated about two and one-half times its greatest diameter in front of posterior margin of holoventral plate. Length, 0.61 mm.; width, 0.35 mm.

*Type locality*.—Batesburg, South Carolina.

*Type slide*.—Cat. No. 24745, U.S.N.M.

Described from several cotypes mounted on two slides. Specimens on one slide taken from a small bat (*N. humeralis*), July 3, 1912, and on other slide from a bat, May 20, 1914. Both lots from type locality by E. A. McGregor.

#### Genus SERPENTICOLA Ewing.

##### SERPENTICOLA SERPENTIUM (Hirst).

*Female*.—A medium-sized, rather long and hairy species. Palpi about reaching the tips of anterior femora. Two dorsal shields, the anterior shield covering most of the cephalothorax and being almost circular, while the posterior shield is minute. It is also almost circular and is situated directly above the anal plate. Peritreme slightly curved and not quite reaching the middle of second coxa. Sternal plate fully twice as broad as long and lying entirely between the second coxae; anterior setae situated slightly behind the anterior margin but posterior setae situated directly on the lateral margins. Anal plate pear-shaped in outline, anus with longitudinal diameter much the greater, rim heavily chitinized. The anus itself is situated entirely in front of the middle transverse line; paired setae situated about halfway between rim of anus and lateral margins of anal plate; median seta situated a little over its length from the posterior margin of anal plate. Anterior legs considerably longer than second pair. Length, 0.79 mm.; width, 0.39 mm.

*Male*.—Unknown.

*Type locality.*—Species originally described from specimens obtained in London zoological gardens.

*Type.*—The location of the type is unknown to the author.

This description based on three females, one from snake, Atlanta, Georgia; and two from snake, New York City. Collector (?) Clifford Pope.

### Genus ICHORONYSSUS Kolenati.

#### KEY TO NORTH AMERICAN SPECIES.

- a*<sup>1</sup>. Dorsal shield about as broad as long..... **I. semitectus** (L. Koch).  
*a*<sup>2</sup>. Dorsal plate scarcely half as broad as long.  
*b*<sup>1</sup>. Dorsal shield of female with lateral margins concave.  
*c*<sup>1</sup>. Sternal plate of female about two-thirds as long as broad and posterior margin but slightly arched; coxae without posterior spines.  
**I. sternalis**, new species.  
*c*<sup>2</sup>. Sternal plate of female scarcely one-half as long as broad; coxae II, III, and IV with large posterior spines..... **I. carnifex** (C. L. Koch).  
*b*<sup>2</sup>. Dorsal shield of female with lateral margins decidedly convex.  
**I. isabellinus** (Oudemans).

#### ICHORONYSSUS SEMITECTUS (L. Koch).

Trägårdh in his *Monographie der arktischen Acariden* gives a record of this species from Greenland. A brief diagnosis of the female is here given, data being obtained chiefly from Trägårdh's figures.

*Female.*—Dorsal shield covering the cephalothorax completely for most of its length and reaching somewhat beyond the middle of the abdomen; it is almost as broad as long. Peritreme curved but not sinuous and reaching to about the anterior margin of front coxae. Sternal plate about as broad as long and broadly excavated on the sides near the second coxae. Anal plate somewhat triangular; anus in front of middle transverse line; anal or paired setae small; median setae a long spine reaching for half its length beyond the tip of abdomen.

Greenland specimens from *Myodes torquatus*. Other records for this species come from Siberia and Novaja Zemlya.

#### ICHORONYSSUS STERNALIS, new species.

*Female.*—Mounted specimen red (probably due to engorgement). Dorsal shield entire and covering most of the body, evenly rounded behind. Peritreme sinuous and extending well in front of the second coxae. Sternal plate broader than long and barely reaching the third coxae; sternal setae subequal; anterior pair situated just behind the anterior margin; middle pair situated inside lateral margins and in a direct line between the anterior and posterior setae; posterior setae situated at the middle of angular processes. Anal plate broadly rounded in front and pointed behind; anus slightly oval in outline

and situated entirely in front of middle transverse line; paired setae very long and situated about one-half the distance from the rim of the anus to the lateral margins; median seta very long and situated about one-half its length from the tip of anal plate. Length, 0.81 mm.; width, 0.45 mm.

*Male*.—Unknown.

*Type locality*.—Plummer Island, Maryland.

*Type*.—Cat. No. 24746, U.S.N.M.

Described from a single female the only specimen present in the U.S.N.M. collection. It was taken from a woodchuck, May 19, 1912, by H. S. Barber.

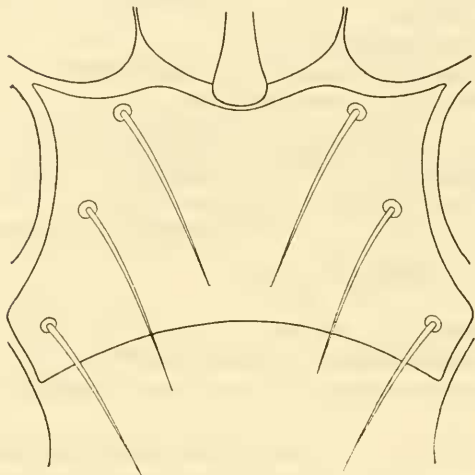


FIG. 6.—*ICHORONYSSUS STERNALIS*, NEW SPECIES. STERNAL PLATE.

*ICHORONYSSUS CARNIFEX*  
(C. L. Koch).

*Female*.—Stout and sparsely clothed with minute setae. Dorsal shield large, not entirely covering the cephalothorax, lateral margins behind the shoulders concave. Peritreme very long and sinuous, extending slightly beyond the first coxae. Sternal plate archlike, having the

posterior margin deeply crescentic, reaching the third coxae; anterior setae situated almost on the anterior margin; middle setae situated almost on lateral margins but outside of line from anterior to posterior setae; posterior setae situated at about equal distances from inner, outer, and posterior margins of corner projections of sternal plate; all sternal setae long and subequal. Anal plate somewhat heart-shaped; anus oval in outline and situated entirely in front of middle transverse line; anal area large and extending almost to base of median seta. Legs stout, especially first two pairs; femur of leg I with two conspicuous spines above, the inner being the longest. Length, 0.60 mm.; width, 0.36 mm.

*Male*.—The writer has never seen a male of this species, but Oudemans has given a very complete description of it, and a group of eight drawings. The following diagnosis is made from Oudemans's drawings: Dorsal shield very large, covering most of the body above and extending almost to the tip of abdomen, broadest at the shoulders, slightly convex on the sides, and broadly rounded behind. Holoventral plate broadest at its angular extensions between the

second and third coxae, and expanded on the abdomen; setae as follows: A pair just behind anterior margin; another opposite second coxae; a third and fourth pair opposite third coxae; four pairs on broadened abdominal part of plate; an anal pair and a posterior median seta. Anus situated its greatest diameter in front of posterior margin of holoventral plate. Length, 0.44 mm.; width, 0.26 mm.

*Type locality*.—(?) Germany.

*Type*.—The location of the type is unknown to the author.

This description is based on a specimen from the house mouse, taken at Corvallis, Oregon, January 9, 1912, by the writer. I can find no other record of the occurrence of this species in North America. Exotic records are from *Talpa*, *Mus*, *Vespertilio*, *Arvicola*, and *Pterygistes*.

ICHORONYSSUS ISABELLINUS (Oudemans).

*Female*.—Body sparsely clothed with moderate setae. Dorsal shield covering all the body above except a narrow margin on the sides. Peritreme sinuous and extending as far as the anterior margin of the front coxae. Sternal plate archlike and continued between first and second coxae as cusps; anterior setae situated almost on the anterior margin; middle setae situated almost on the lateral margins; posterior setae situated near tip of produced posterior angles; all sternal setae long, slender, and subequal. Anal plate broadly rounded in front; anus almost circular, with rim somewhat thickened behind, and situated entirely in front of the middle transverse line; paired setae situated about halfway between the margin of anus and lateral margins of anal plate; anal area scobinate and extending about halfway to base of median seta. Longest dorsal spine of femur I about equal in length to width of this segment. Length, 0.66 mm.; width, 0.32 mm.

*Male*.—The writer has never seen a male of this species. The following synopsis of characters is made from six good figures by Oudemans: Dorsal plate covering almost all of the upper surface of the body, sides almost straight, posterior margin rounded and at the tip of abdomen. Holoventral plate angularly produced between first and second coxae and second and third coxae, but not between third and fourth coxae, expanded slightly on the abdomen. All of the setae on the holoventral plate except the posterior median seta are arranged into two lateral irregular rows, there being four pairs on the sternal region and four on the abdominal region exclusive of the anal setae. Anus situated about twice its greatest diameter from the posterior margin of holoventral plate. Length, 0.50 mm.; width, 0.34 mm.

*Type locality.*—Holland.

*Type.*—The location of the type is unknown to the author.

North American records as follows: From mouse, Washington, District of Columbia; from mole, Corvallis, Oregon, June 3, 1912, by the writer. Exotic hosts of this species: *Putorius*, *Paludicola*, and *Mus*.

**Genus LEIOGNATHUS Canestrini.**

KEY TO NORTH AMERICAN SPECIES.

- a<sup>1</sup>. Dorsal shield of female about as broad near the middle of the abdomen as at the shoulders; anal plate somewhat triangular, with pointed caudal area. L. crosbyi (Ewing).
- a<sup>2</sup>. Dorsal shield of female only about one-half as broad near the middle of abdomen as at shoulders; anal plate of female not at all triangular and with caudal area broadly rounded behind. . . . . L. constrictus, new species.

**LEIOGNATHUS CROSBYI (Ewing).**

*Female*—Stout, with body clothed above with short setae. Palpi long, reaching to about the middle of anterior tibiae. Dorsal shield about as broad near the middle of the abdomen as at the shoulders and broadly rounded behind. Peritreme quite sinuous and extending to the front margin of anterior coxae. Sternal plate slightly broader than long; reaching the third coxae and anterior corners produced into cusps; anterior setae situated just behind the anterior margin; middle setae situated away from lateral margins but outside a line from anterior to posterior seta; posterior setae situated nearer lateral than posterior margin; all sternal setae long, slender, and subequal. Anal plate with broadly rounded anterior margin and almost straight sides; anus with longitudinal diameter greater than transverse; anal area minute; setae of anal plate about straight and subequal. Legs short and stout. Length, 0.60 mm.; width, 0.38 mm.

*Male.*—Unknown.

*Type locality.*—Rockport, Missouri.

*Type.*—Type (holotype) established at time of original description, and at present in the writer's collection. A single record from a bat (*Vesper subulatus*), type locality, by C. R. Crosby.

**LEIOGNATHUS CONSTRICTUS, new species.**

*Female.*—Stout, with the body constriction rather pronounced. Palpi long, reaching to the tibia. Dorsal plate only about one-half as broad near the middle of abdomen as at shoulders. Peritreme very sinuous and extending to opposite the anterior coxae. Sternal plate about as broad as long. Anal plate twice as long as broad; anus with longitudinal diameter greater than transverse, its rim poorly chitinized and very thin behind; paired setae situated about halfway



between rim of anus and lateral margins; median seta situated slightly more than its length behind rim of anus, and subequal to paired setae; anal area extending halfway to base of median seta, scobinate. Legs of medium length; anterior pair longer than second pair; tarsus I about twice as long as tibia I; third legs apparently the shortest. Length, 0.60 mm.; width, 0.38 mm.

*Male*.—Unknown.

*Type locality*.—Rochester, New York.

*Holotype*.—Cat. No. 24747, U.S.N.M. A large female, mounted ventral side up near the top of slide selected, only one other large female on type slide.

Seven specimens from wood thrush, type locality, by G. A. Franck.

### Genus *LIPONYSSUS* Kolenati.

#### KEY TO NORTH AMERICAN SPECIES.

- a*<sup>1</sup>. Anal plate of female triangular, or almost so; paired setae, or anal setae, situated on a transverse line drawn at the posterior rim of anus; anal rim very thick. *L. triangulus*, new species.
- a*<sup>2</sup>. Anal plate of female in no way triangular; paired setae situated in front of a transverse line drawn at the posterior rim of anus; anal rim not so thick.
- b*<sup>1</sup>. Anus situated less than one-half its greatest diameter from the front margin of anal plate.
- c*<sup>1</sup>. Rim of anus of uniform thickness and anal setae situated but slightly in front of posterior margin of anus..... *L. bacoti* (Hirst).
- c*<sup>2</sup>. Rim of anus thicker in front and behind than on the sides, anal setae situated considerably in front of the posterior margin of anus. *L. pacificus*, new species.
- b*<sup>2</sup>. Anus situated over two-thirds its greatest diameter from the front margin of anal plate.
- c*<sup>1</sup>. At the middle of dorsum of abdomen dorsal shield of female is over one-half as broad as body.
- d*<sup>1</sup>. Sides of dorsal shield of female converging rapidly on the abdomen and tip of same about over anus.
- e*<sup>1</sup>. Dorsal shield of female never more than about three-fourths the width of the cephalothorax..... *L. americanus* Banks.
- e*<sup>2</sup>. Dorsal shield of female practically covering the cephalothorax to behind the insertion of second legs..... *L. occidentalis*, new species.
- d*<sup>2</sup>. Sides of dorsal shield not converging rapidly, and in both sexes the same covers most of the body dorsally..... *L. canadensis* Banks.
- c*<sup>2</sup>. At the middle of dorsum of abdomen dorsal shield of female less than one-half as broad as body.
- d*<sup>1</sup>. Anal plate broadly and evenly rounded in front; anal setae situated at the level of the anterior margin of anus..... *L. montanus*, new species.
- d*<sup>2</sup>. Anal plate somewhat pointed in front and not at all evenly rounded; anal setae situated much behind the level of the anterior margin of anus.
- e*<sup>1</sup>. At its broadest place dorsal shield of female not over one-half as broad as cephalothorax..... *L. tenuiscutatus*, new species.
- e*<sup>2</sup>. At its broadest place dorsal shield of female at least two-thirds as broad as cephalothorax..... *L. bursa* (Berlese).

## LIPONYSSUS TRIANGULUS, new species.

*Female*.—Medium sized and stout. Palpi reaching the tips of anterior patellae; chelicerae stout, well chitinized. Dorsal shield broad, at its widest place over three-fifths as wide as cephalothorax. Peritreme long, slightly sinuous and extending to opposite the anterior coxae. Sternal plate about as long as broad and reaching the third coxae; anterior setae situated just behind the anterior margin; middle setae situated on a line between anterior and posterior setae; the latter situated at an equal distance from lateral and posterior margins. Anal plate triangular (hence name *triangulus*); and with greatest diameter longitudinally, rim uniform and very thick; paired setae situated near rim of anus at the posterior margin; caudal area extending almost to base of median seta. Legs stout; coxal rings I and II, each with chitinous tubercle on inside. Length, 0.63 mm.; width, 0.41 mm.

*Male*.—Unknown.

*Type locality*.—Maryland.

*Type (cotypes)*.—Cat. No. 24753, U.S.N.M.

Described from seven individuals taken from King snake, *Lampropeltis calligaster*, U.S.N.M. No. 61726.

## LIPONYSSUS BACOTI (Hirst).

*Female*.—Palpi slender, reaching to about the tips of first femora; chelicerae very slender and fitted for piercing chiefly, the cutting surfaces being poorly developed. Dorsal shield reduced, at its broadest place about one-half as broad as the cephalothorax, behind the shoulders the lateral margins are wavy. Peritreme long, slightly sinuous, and extending almost to the anterior margin of coxa I. Sternal plate extending entirely between the second coxae, its anterior margin almost straight; front setae situated directly on the anterior margin; middle setae situated between front and rear setae, the latter being at the apex of posterior angles. Anal plate broadly and evenly rounded in front; anus front of middle transverse line, rim uniform; paired setae situated at the level of the posterior margin of anus; median seta situated almost twice its length behind the anus; caudal area reduced, crescentic and scobinate. Length, 0.78 mm.; width, 0.56 mm.

*Male*.—Notwithstanding a large number of slides of this species are in the United States National Museum, no male is present. The following facts relative to the male are gleaned from Hirst's description: Dorsal shield, "almost as wide and long as the body, but leaving a narrow lateral strip of unprotected integument (except anteriorly)." The "sternal plate" (holoventral plate) is described as follows: "Long, narrow, and furnished with eight or nine pairs of long hairs and the usual unpaired posterior hair; it is slightly nar-

rowed before the anal portion." Hirst gives the length of the body of the male as 0.43 mm.

*Type locality*.—Assiût, Egypt.

*Type*.—Not established. *Type host*.—*Mus norvegicus*.

North American records as follows: On mice, New York City, December 30, 1919; on mouse, St. Louis, Missouri, from Dr. L. Loeb; from young mouse, H. L. Osborn; on heads of children and on mice, Laredo, Texas, through Public Health Service, 1921; from walls of railroad station, Longwood, Mississippi, April 12, 1921 (Mound No. 1034), also specimens from same locality by Dr. Van Dine (Mound No. 1031); biting men working in basement, Fort Worth, Texas, April 21, 1921; annoying man, Dallas, Texas, May 25, 1921 (Bishopp No. 10062); in hair of house mouse, Washington, District of Columbia, by Dr. E. Francis, July 1921. Exotic records are from Egypt, Abyssinia, Australia, and Argentina.

**LIPONYSSUS PACIFICUS, new species.**

*Female*.—Palpi extending to the tips of femora of front legs. Chelicerae slender; arms slender and slightly unequal, the outer being a little longer and hooked at the tip.

Dorsal shield almost reaching across the cephalothorax at the shoulders, lateral margins slightly convex behind the shoulders. Sternal plate twice as broad as long and extending only between the second coxae; posterior angles produced into long cusps; anterior setae directly upon the anterior margin of

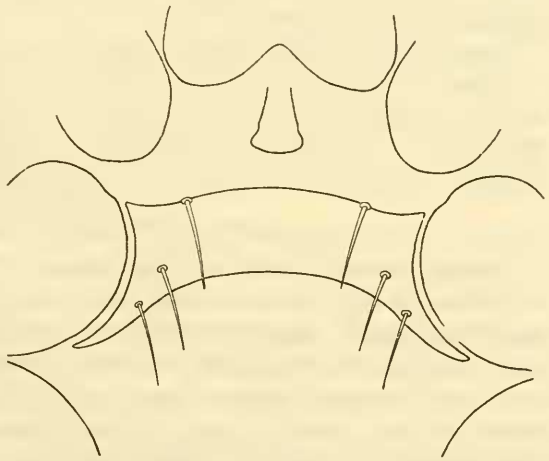


FIG. 7. *LIPONYSSUS PACIFICUS*, NEW SPECIES. STERNAL PLATE.

sternal plate; all sternal setae subequal and in a row. Anal plate broadly rounded in front; anus with greatest diameter longitudinally, rim thicker in front and behind; anus situated entirely in front of a middle transverse line; anterior setae situated slightly behind the level of the central point of anus; median seta extending beyond the tip of plate; caudal area extending to over halfway to the base of median seta. Legs moderate. Length, 0.57 mm.; width 0.32 mm.

*Male*.—Unknown.

*Type locality*.—Corvallis, Oregon.

*Type (cotypes)*.—Cat. No. 24752, U.S.N.M.

Many specimens from nest of brewer's blackbird, by A. J. Stover.

## LIPONYSSUS AMERICANUS Banks.

*Female*.—Palpi moderate; chelicerae slender, each with two slender arms. Dorsal shield large, broadest over the bases of third legs; lateral margin behind the shoulders convex. Peritreme sinuous, extending to opposite the first coxae. Sternal plate over twice as broad as long and extending entirely between the second coxae; anterior setae situated directly upon the anterior margin; middle setae situated inside of lateral margins and almost directly between the first and last setae; last setae situated nearer the lateral margins than the middle setae; all sternal setae of moderate length, slender and subequal. Anal plate rounded in front and about twice as long as broad; anus almost circular and with uniform rim; paired setae halfway between rim and lateral margin; median seta situated about its length behind anus; caudal area small and crescentic. Legs moderate. Length, 0.55 mm.; width, 0.39 mm.

*Male*.—In Banks's original description the sex of the individuals described is not mentioned. The description itself, however, shows that females were at hand. On the type slide (marked holotype) are six individuals, all females. The male of this species, therefore, appears to be unknown.

*Type locality*.—Washington, District of Columbia.

*Type*.—A single female, the specimen situated by itself at the top of type slide, is here selected as type. Taken from arm of person, Washington, District of Columbia; on yellow-bellied sapsucker, Raleigh, North Carolina, March 23, 1895, by H. H. and C. S. Brimley.

## LIPONYSSUS OCCIDENTALIS, new species.

*Female*.—Small, with a large dorsal shield. Palpi moderate; chelicerae stout. Dorsal shield extending across the body at the shoulders, lateral margins behind the shoulders convex. Peritreme very long and very sinuous, reaching the anterior coxae. Sternal plate about three times as broad as long, barely reaching the third coxae and with posterior margin strongly arched; anterior setae situated on anterior margin; middle setae situated on a line between the anterior and posterior setae; the latter almost at the tip of posterior angles. Anal plate egg-shaped in outline; anus small, almost circular, with uniform rim and situated in front of a middle transverse line; paired setae situated near the level of the anterior margin of anus; posterior setae situated more than its length behind anus; caudal area forming a lobelike projection of anal plate. Legs moderate. Length, 0.61 mm.; width, 0.31 mm.

*Male*.—Unknown.

*Type locality*.—Montana.

*Type (holotype)*.—Cat. No. 24749, U.S.N.M. Type specimen the one of two contained females, which is mounted dorsal side up, with

specimens of *L. montanus* on type slide. One record: "On *S. h. richardsoni*, King coll., Dallas acc. 2467."

LIPONYSSUS CANADENSIS Banks.

*Female*.—Medium-sized. Palpi reaching to about the tips of femora; chelicerae very slender and each arm slightly hooked at the tip. Dorsal shield large, sides irregularly convex, and not broadly and evenly rounded behind. Peritreme long and sinuous and extending to opposite the first coxae. Sternal plate over twice as broad as long and reaching only between the second coxae; anterior setae situated slightly behind anterior margin; middle setae situated almost on the lateral margins; posterior setae situated at apex of projecting posterior corners. Anal plate broadly and evenly rounded in front; anus almost circular and with thin, uniform rim; paired setae situated opposite middle of anus; median seta situated its length from the anus; caudal area rather small, crescentic and scobinate. Legs moderate; posterior pair extending beyond tip of abdomen. Length, 0.52 mm.; width, 0.28 mm.

*Male*.—The writer has never observed the male of this species. According to Banks, the body of the male is nearly twice as long as broad. This is the only statement relative to the male characters in his description. It might be inferred, therefore, that the two sexes are much alike except for those characters that are commonly recognized in the sexual dimorphism found in the family.

*Type locality*.—Guelph, Ontario.

*Type*.—No published selection of type.

This description based on two United States National Museum lots; one consisting of 13 specimens taken from a chicken, at Framingham Center, Massachusetts; the other of 13 specimens taken from nest of purple grackle, Long Bridge, Alexandria County, Virginia, by Shannon. Other North American records are, on English sparrow, red-eyed vireo, meadow lark, and kingbird, Guelph, Ontario.

LIPONYSSUS MONTANUS, new species.

*Female*.—Large, and similar to females of *Haemogamasus*. Palpi large; chelicerae shearlike but the hooked tips of both arms rather blunt and suggesting the toothed arms of *Haemogamasus*. Dorsal shield medium, lateral margins behind shoulders very slightly convex. Peritreme long, sinuous, and extending to opposite coxae I. Sternal plate of female with posterior corners broadly rounded and not extended. Anal plate very large, broadly rounded in front and somewhat truncate behind; anus subcircular, with uniform rim and situated almost centrally; paired setae situated far forward, being at the level of the anterior margin of the anus; median seta situated about its length behind the anus; caudal area crescentic, scobinate. Legs

long; anterior pair longer than the second pair and about equal to the last pair; last pair reaching to about the tip of the abdomen. Length, 1.02 mm.; width, 0.61 mm.

*Male*.—Unknown.

*Type locality*.—Florence, Montana.

*Type (holotype)*.—Cat. No. 24751, U.S.N.M. On type slide are three females, one replete and two only slightly engorged. Only one of the latter is mounted ventral side up, and it is selected as type. On "*S. h. richardsoni*," at Florence and Derby, Montana (Dallas acs. 2452 and 2294).

**LIPONYSSUS TENUISCUTATUS, new species.**

*Female*.—Palpi rather large, reaching tips of patellae; chelicerae slender. Dorsal shield very long, extending from base of beak to tip of abdomen, greatest width less than one-half that of body, margins behind the shoulders slightly convex. Peritreme long, sinuous, and extending to opposite the first coxae. Sternal plate broader than long. Anal plate very long and somewhat pointed in front; anus oblong, rim uniform; paired setae long, equal to longitudinal diameter of anus and situated opposite the middle of same; median seta longer, slightly, than the paired setae and situated about its length behind the anus; caudal area extending halfway from tip of plate to base of median seta. Legs moderate; leg I longer than leg II, and with tibia about one and three-fourths as long as wide; last pair of legs scarcely reaching the tip of abdomen. Length, 0.62 mm.; width, 0.37 mm.

*Male*.—Unknown.

*Type locality*.—Cuba (?).

*Type (holotype)*.—Cat. No. 24750, U.S.N.M.

A small female specimen obtained on sweet potatoes from Cuba, collected at Pascagoula, Mississippi.

**LIPONYSSUS BURSA (Berlese).**

*Female*.—Smaller than the female of *Dermanyssus gallinae*. Palpi rather large, extending to the tip of patella of leg I; chelicerae with cutting surfaces of both arms well developed, each arm tipped with a straight, spinelike hook set at angles to main axis. Dorsal shield large, sides convex behind the shoulders, at its greatest width falling short of the lateral margins of cephalothorax. Peritreme long and sinuous, reaching to opposite coxae I, and with a slight bulblike enlargement at its opening at the stigma. Sternal plate about twice as broad as long and lying entirely between second coxae. Anal plate about twice as long as broad, pointed in front; anus with longitudinal diameter considerably greater than transverse, rim uniform, and situated entirely in front of middle transverse line; paired setae sit-

uated halfway from rim of anus to lateral margins of plate; caudal area small, scobinate. Legs large; first and last pair subequal and longer than the two other pairs. Length, 0.72 mm.; width 0.41 mm.

*Male*.—Smaller than the female and more slender, especially in the abdominal region. Chelicerae stout; fixed arm longer than movable, doubly curved and with an inner toothlike protuberance. Dorsal shield similar to that of the female. Holoventral plate widest at its angular expansions between the second and third coxae, on the abdomen first slightly expanded then much narrowed in front of anus. Holoventral plate with the usual setae on sternal region, but on the abdominal region, with only two marginal pairs except for the anal pair and posterior median seta. Anus oval in outline and situated about twice its greatest diameter in front of posterior margin of holoventral plate. Length, 0.61 mm.; width, 0.29 mm.

*Type locality*.—Buenos Aires, Argentina.

*Type*.—(?) Not selected in original description.

North American records as follows: On chickens (Dallas Lab. acc. 2568); on poultry, Atlantic Beach, Florida, June, 1915; infesting house, North White Plains, New York, June, 1911; on porch of house, near Ottowa, Canada; on common hen, Canal Zone, Doctor Darling (No. 157); on chickens, Winter Park, Florida (Dallas acc. 2507); on poultry, Beltsville, Maryland, April 2, 1917; on poultry, Raymond, Illinois, 1919, by H. P. Wood; on poultry, Lafayette, Indiana, October 19 and 24, 1921.

#### Genus DERMANYSSUS Dugés.

##### KEY TO NORTH AMERICAN SPECIES.

*a*<sup>1</sup>. Peritreme long and sinuous, extending beyond the second coxae.

*D. gallinae* (Redi).

*a*<sup>2</sup>. Peritreme short, broad, and almost straight, and not extending beyond the third coxae..... *D. americanus*, new species.

##### DERMANYSSUS GALLINAE (Redi).

*Female*.—Considerably larger than male. Palpi reaching the tips of femora of anterior legs; chelicera apparently with both arms present but each is needlelike, and the two fit together to form a single piercing structure. Dorsal shield large, convex behind the shoulders, and almost truncate behind. Peritreme with a slight bulb near stigma; extending to between coxae I and II. Sternal plate a transverse band of chitin passing between the anterior aspects of the second coxae but also reaching the first coxae; it is about four times as broad as long and bears a single pair of setae situated just behind the anterior margin. Anal plate with almost straight anterior margin; anus with greatest diameter longitudinally, rim thin except behind, where it is very thick, paired setae about twice

as long as median setae; caudal area a slender marginal crescent. Legs large; anterior and posterior pairs longer than the others; tibia I slightly over twice as long as broad. Length, 0.69 mm.; width, 0.40 mm.

*Male*.—Much smaller than most of the females. Chelicerae each with the following armature: Two long, sinuous, tapering and adhering elements, one which surpasses the other with its distal, setiform, hooklike terminal portion; and a short spinelike, or styletlike, process, the latter probably representing the fixed chela. Dorsal shield similar to that of the female but more slender, more rounded at the posterior margin, and extending for almost the entire body length. Holoventral plate almost equally expanded into cusps between the first and second, second and third, third and fourth coxae. Anus situated less than its greatest diameter from the posterior margin of holoventral plate. Length, 0.61 mm.; width, 0.32 mm.

This species is probably present in all localities all over the world where chickens are raised to any extent. The following American hosts are known: Chickens, canaries, pigeons, English sparrows, and towhee (?). The species annoys also all domestic animals and man, but seldom attacks a mammalian host.

DERMANYSSUS AMERICANUS, new species.

*Female*.—Palpi extending to beyond the tips of the anterior femora; chelicera showing the two elements (arms) quite distinctly. Peritreme very short, not extending beyond third coxa; it is almost straight and is slightly bulbous near the stigmal opening. Sternal plate (apparently) crescentic and with three pairs of long, subequal setae. Anal plate slightly longer than broad, broadly rounded both in front and behind; anus with longitudinal diameter almost twice as great as transverse, rim thin in front, thicker on the sides, and very thick behind. The anus is situated almost entirely behind a middle transverse line; paired setae situated slightly behind the level of the anterior margin of anus; caudal area a narrow, crescentic area along margin of plate. Legs very short and stout; last pair falling far short of tip of abdomen. Length, 0.62 mm.; width, 0.36 mm.

*Male*.—Not known.

*Type locality*.—Washington, District of Columbia.

*Type (holotype)*.—Cat. No. 24754, U.S.N.M., the lower of the two specimens on type slide selected.

Two individuals from English sparrow, Washington, District of Columbia, December 19, 1913, by R. S. Shannon.



## Genus ALLODERMANYSSUS Ewing.

## ALLODERMANYSSUS SANGUINEUS (Hirst).

*Female*.—Palpi slender, reaching to the tips of anterior femora; chelicerae showing plainly the needlelike elements representing both arms. Dorsal shield divided; anterior shield broadest at the shoulders, lateral margins behind the shoulders concave; posterior shield, circular, minute. Sternal plate squarish, lying entirely between the second coxae, with three pairs of subequal marginal setae. Anal plate egg-shaped in outline, anterior margin broadly rounded; anus situated centrally, rim very thin in front and on the sides, but enormously thickened behind; paired setae situated at the level of the center of the anus; median seta situated about two-thirds its length behind anus; caudal area reaching about halfway to the base of median seta. Legs very long and slender. Length, 0.91 mm.; width, 0.46 mm.

*Male*.—Not observed by the writer. Hirst states in regard to the male: "Dorsal shield wide anteriorly but progressively narrowed posteriorly, the terminal part of it being quite narrow and the extreme end blunt —." Also he states: "Sternoventral plate (holoventral plate of the writer) with the sides not so straight as in *D. muris*, and narrowed so as to form a distinct neck in front of the slightly enlarged anal portion; eight pairs of hairs and the usual unpaired posterior hair are present on this plate." The length of the body according to Hirst is 0.7 mm.

*Type locality*.—Egypt.

*Type*.—Has not been selected.

This description of female based on five specimens taken on a desk, Washington, District of Columbia, June 30, 1909, by Mr. Dewey. This is the only American record known to the writer. Hirst obtained specimens from *Mus*, *Arvicantis*, and *Acomys*.

EXPLANATION OF PLATES ILLUSTRATING THE ANAL PLATE  
OF FEMALE.

(All of these drawings are of the same magnification ( $\times 400$ ) and were made by the writer.)

## PLATE 1.

- FIG. 1. *Tetragnyssus spiniger* (Ewing and Stover).  
2. *Tetragnyssus bermudaensis* (Ewing).  
3. *Ceratomyssus ceratognathus*, new species.  
4. *Serpenticola serpentium* (Hirst).  
5. *Ichoronyssus sternalis*, new species.  
6. *Ichoronyssus isabellinus* (Oudemans).  
7. *Leiognathus crosbyi* (Ewing).  
8. *Leiognathus constrictus*, new species.  
9. *Liponyssus triangulus*, new species.  
10. *Liponyssus bacoti* (Hirst).

## PLATE 2.

- FIG. 11. *Liponyssus pacificus*, new species.  
12. *Liponyssus americanus* Banks.  
13. *Liponyssus occidentalis*, new species.  
14. *Liponyssus canadensis* Banks.  
15. *Liponyssus montanus*, new species.  
16. *Liponyssus tenuiscutatus*, new species.  
17. *Liponyssus bursa* (Berlese).  
18. *Dermanyssus gallinae* (Redi).  
19. *Dermanyssus americanus*, new species.  
20. *Allodermanyssus sanguineus* (Hirst).